



## EPA Region 7 TMDL Review

**TMDL ID:** KS-LA-11-522-1      **Waterbody ID:** KS-LA-11-522\_18, KS-LA-11-522\_19,  
KS-LA-11-522\_22, KS-LA-11-656\_21  
**Waterbody Name:** COW CREEK AND LITTLE COW CREEK (ABOVE WILLOWBROOK) --  
CHLORIDE  
**Tributary:** JARVIS CREEK, DRY CREEK, SALT CREEK, OWL CREEK  
**Pollutant:** CHLORIDE  
**State:** KS      **HUC:** 11030011  
**BASIN:**  
**Submittal Date:** 6/30/2006  
**Approved:** Yes

### Submittal Letter

*State submittal letter indicates final TMDL(s) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act.*

Letter, dated June 30, 2006, and received by EPA on June 30, 2006, formally submitted this TMDL for approval under Section 303(d).

### Water Quality Standards Attainment

*The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.*

Over the period of record, chloride concentration averages were established for KDHE ambient stream monitoring stations 522, 656, and 657. The chloride averages for the sampling stations are illustrated in Table 1. Each site had a number of samples that exceeded the established water quality standards. There is significant scatter in the sample data. Chloride exceedances over 250 mg/l cease once flows reach 10 percent exceedance levels for stations 657 and 522 and 20 percent exceedance levels for station 656 (Figures 2, 3, and 4). Station 657 rarely had any chloride samples below 250 mg/l for flows above the 10 percent exceedance levels.

### Numeric Target(s)

*Submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.*

The Kansas chloride criteria for domestic Water Supply is 250 mg/L at any point of domestic water supply diversion (K.A.R.28-16-28e(c)(3)(A)). For aquatic life support [acute criterion] is 860 mg/l for (KAR 28-16-28e(c)(2)(D)(ii)).

### Numeric Target(s) and Pollutant(s) of concern

*An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety that do not exceed the load capacity.*

The desired endpoint of this TMDL is to protect the domestic water supply by maintaining an average chloride concentration below 250 mg/L in Cow Creek. The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standards fully supporting Drinking Water Use. However, this TMDL will be staged. The current criterion of 250 mg/L of chloride was used to establish the TMDL and its Wasteload Allocations. The background concentrations for stations 657, 656, and 522 have been adjusted based on calibrating the current point source discharge flows, loads, and concentrations with low flow data sets from 1992. Based on these calculations, the background chloride concentrations and flow values for the natural seepage at each of the respective stations was established. For Stations 657, 656, and 522 the tentative background concentration are 460 mg/L, 300 mg/L and 300 mg/l, respectively.

### **Source Analysis**

*Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, non point and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered.*

Cheyenne Bottoms adds a unique characteristic for the natural progression of the chloride load downstream. Water often pools here during dryer conditions and chloride levels increase through evapotranspiration, increasing the concentration of dissolved solids. During wetter conditions, Cheyenne Bottoms could contribute significant chloride loads as the water enters the Little Cheyenne tributary. Thus, Cheyenne Bottoms has the potential for contributing higher chloride loads during moderately high flows. Based on a Kansas Geological Survey report on the Chloride impairment in the Cow Sub-basin, it is estimated up to 80% of the chloride content is from natural sources during low flow conditions in Cow Creek near Lyons. Oil-field brine accounts for approximately 10-20% of the chloride load south of Lyons and accounts for the largest anthropogenic chloride source. The flushing and recharge of groundwater are slowly diluting the saline waters produced from the historical practice of discarding brine pollution on the surface. (Whittemore)

### **Allocation**

*Submittal identifies appropriate wasteload allocations for point, and load allocations for nonpoint sources. If no point sources are present the wasteload allocation is zero. If no nonpoint sources are present, the load allocation is zero.*

The basic condition of the impaired condition is caused by natural background loadings, therefore point source controls are not emphasized greatly, with the exception of the City of Lyons and the North American Salt Company. The North American Salt Company will presumably meet several remediation goals in the near future based on recent groundwater remediation modeling. The model suggests that the chloride plume will reduce sufficiently enough for outfall 004 to be shut off in 2008. The North American Salt Company anticipates that two hundred gallons per day of discharge that is currently being routed to outfall 003 will be re-directed for deep well injection by approximately 2015. This will roughly leave eighty gallons per day to be discharged to outfall 003, which will most likely originate from the East Water Well. It is foreseeable that the water being discharged to outfall 003 at this future date will have a considerably lower chloride concentration.

The goal for the City of Lyons is to achieve operational and source reduction capabilities to discharge chloride concentrations no greater than 300 mg/L. Since this may not be achievable in the immediate future, this TMDL does not account for this reduction until the year 2025.

### **WLA Comment**

Reductions in the existing point source loads will not materially affect the impaired conditions and are not emphasized greatly, with the exception of the City of Lyons and the North American Salt Company (NASC). The NASC is currently implementing a remedial program to control groundwater contamination. Brine will eventually dilute out over time, a load allocation was based on a brine dilution of 1% per year under this TMDL. Table 13 of the TMDL Document displays the total loads, wasteloads and load allocations for the Stage II loads that will be in place currently and in year 2025 under this TMDL at the 50%, 75%, and ~90% flow exceedance frequencies.

## **LA Comment**

Brine will eventually dilute out over time, a load allocation was based on a brine dilution of 1% per year under this TMDL. Table 13 of the TMDL Document displays the total loads, wasteloads and load allocations for the Stage II loads that will be in place currently and in year 2025 under this TMDL at the 50%, 75%, and ~90% flow exceedance frequencies.

## **Margin of Safety**

*Submittal describes explicit and/or implicit margin of safety for each pollutant. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided.*

The Margin of Safety is implicitly established by holding point sources above station 657 to concentrations below background levels and by maintaining adequate load balance at the North American Salt Company. Since the elevated chloride levels seen in the streams are predominantly caused by the natural loadings of saline groundwater from underlying geologic formations, the only mitigating factor to those load allocations is the dilution provided by the point sources. By not allowing the wasteload allocations to be established by the background concentrations above station 657, by balancing the current wasteload allocation from the North American Salt Company and by conservatively estimating future wasteload allocations once the remediation goals are met at the North American Salt Company, the dilution base is secured and the Stage II endpoints will be achieved by 2025.

## **Seasonal Variation and Critical Conditions**

*Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s).*

Seasonal variation has been incorporated in this TMDL through the documentation of the seasonal consistency of elevated chloride levels.

## **Public Participation**

*Submittal describes public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s).*

Public meetings to discuss TMDLs in the Lower Arkansas Basin were held on June 7, 2006 in Hutchinson. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Lower Arkansas Basin. Public Hearings on the TMDLs of the Lower Arkansas Basin was held on June 7, 2006 in Hutchinson. The Lower Arkansas Advisory Committee met to discuss the TMDLs in the basin on June 7, 2006.

## **Monitoring Plan for TMDL(s) Under Phased Approach**

*The TMDL identifies the monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used).*

KDHE will continue to collect bimonthly samples from permanent stations along Cow Creek and Little Cow Creek near Lyons and in Cow Creek above Willowbrook. Based on the priority status will be evaluated in 2011 and thereafter, including application of numeric criterion based on background concentrations.

## **Reasonable assurance**

*Reasonable assurance only applies when reductions in nonpoint source loading is required to meet the prescribed waste load allocations.*

The "Old North Lyons Mine Plume Remediation Program" began in the late-1990s and contains two groundwater remediation projects: a "Southern Containment Project" and a "Northern Containment Project." Both projects were developed and implemented as a result of voluntary agreements between the KDHE and the North American Salt Company. A salt mine, separate from the present-day North American Salt Company facility, operated from the late-1800s until approximately 1950. Historical salt manufacturing and material handling practices conventional to the salt industry during that time caused localized contamination of soil and groundwater in an area to the northeast of the city of Lyons. A responsible party for this former salt mine site has not been identified. KDHE assumed responsibility for site closure and conducted such activities in the early 1990s. Legacy contamination in the form of chloride contaminated groundwater has migrated to the south from the former mine site. This localized plume has impacted the remediation performance of the Cow Creek Aquifer Remediation Program and has threatened the water quality of the domestic water supply wells of the City of Lyons. As a result, the KDHE installed the infrastructure for the remediation of the Old North Lyons Mine Plume. Under the voluntary agreements, the North American Salt Company facility is operating the Old North Lyons Mine Plume Remediation Program. The KDHE Bureau of Environmental Remediation is managing this program and is confident that: the subject chloride plume is under containment and control, significant progress will continue to be achieved in reduction of the plume, remediation should continue to progress in accordance with the established plan and associated remediation model, and the City of Lyons drinking water supply wells will be fully protected. The KDHE has approved and funded over \$1.5 million associated with the "Southern" and "Northern" containment remediation projects.